Section: Orthopaedics

Original Research Article

FUNCTIONAL OUTCOME OF POSTERIOR CRUCIATE LIGAMENT TIBIAL AVULSION FRACTURES TREATED WITH CANNULATED CANCELLOUS SCREW FIXATION: A PROSPECTIVE STUDY

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ABSTRACT

Background: Posterior Cruciate ligament (PCL) tibial avulsion fractures are uncommon injuries that can result in knee instability if not treated appropriately. Surgical fixation is generally recommended for displaced fractures. The objective is to evaluate the functional and radiological outcomes of PCL tibial avulsion fractures managed with Cannulated screw fixation.

Materials and Methods: This prospective study was conducted over a period of 24 months (February 2024 to February 2026) and included 20 patients with displaced PCL tibial avulsion fractures. All patients underwent Open reduction and internal fixation using cannulated cancellous screws. Functional Outcomes were assessed using Lysholm Knee score and IKDC grading. Radiological union and range of motion were evaluated during follow-up.

Results: All 20 patients achieved radiological union within an average period of 10-12 weeks. The mean Lysholm score at final follow up was in the good to excellent range. According to IKDC grading, the majority of patients were classified as Grade A or B. Most patients regained near normal range of motion. No major complications such as infection, implant failure, or persistent instability were observed.

Conclusion: Cannulated screw fixation is an effective and reliable method for treating displaced PCL tibial avulsion fractures, providing stable fixation and good functional recovery.

Keywords: PCL Avulsion Fracture, Tibial Spine, Cannulated Screw, Functional Outcome, Knee Injuries.

INTRODUCTION

Posterior cruciate ligament tibial avulsion fractures represent a distinct injury pattern involving detachment of the ligament along with a bony fragment from its insertion.[1-3]

Although relatively rare compared to anterior cruciate ligament injuries, these fractures have significant implications.[4,5]

Such injuries commonly occur due to high-energy trauma, including road traffic accidents and sports-related incidents. If left untreated or inadequately managed, they may result in chronic instability, reduced range of motion, and early degenerative changes of the knee joint. While conservative management may be considered in minimally displaced fractures, surgical fixation is preferred in displaced cases to restore anatomical alignment and ligament tension. Among various fixation methods, cannulated cancellous screw fixation provides stable fixation and allows early mobilization.[6-9]

This study was undertaken to evaluate the functional and radiological outcomes of PCL tibial avulsion fractures treated with cannulated screw fixation over a 24 month period.

MATERIALS AND METHODS

Study Design: Prospective Observational Study
Study Setting: Department of Orthopaedics, Government Medical College and Hospital Cuddalore District.
Study Duration: 24 months, (Feb 2024 - Feb 2026)
Sample size: 20 patients
Inclusion criteria

- Patients aged 18-55 years
- Acute displaced PCL tibial avulsion fractures (<3weeks)
- Fit for Surgical intervention

Exclusion Criteria

- Previous Surgery on affected knee
- Associated multi - ligament injuries
- Severe Systemic illness

Surgical Procedure: All patients underwent open reduction and internal fixation using cannulated cancellous screws. The posterior (Burks and Schaffer's approach) to the knee was utilized to expose the fracture site. The avulsed fragment was reduced anatomically and fixed under fluoroscopic guidance.

Figure 1:

- 45 year Old
- Male
- Alleged H/o RTA 2 wheeler vs 2 wheeler in which patient had an h/o bike directly hit over his knee from anteriorly

Burks and Schaffer Approach (Postero medial approach)

- In an "Invetred L" fashion distal to flexion crease Posteromedial skin Incision (5-7 cm) made
- Interval developed between:

Medial head of Gastrocnemius Retracted Laterally {Neurovascular bundle protected}
Semimembranosus Retracted Medially Posterior Capsule Incised Longitudinally.

Figure 2

- ✓ Cannulated Cancellous screw inserted with **spike washer beneath screw head**
- ✓ Spike washer distributes **Compression** and **prevents Fragment cut-through, provides stable fixation in small ,comminuted fragments**

Spike washer Converts Point compression into surface compression, enhancing fixation stability
Post-Operative Protocol
Immobilization for 2 weeks

Gradual range of motion exercises thereafter
Partial weight bearing at 4 weeks
Full weight bearing after evidence of union

Figure 3: 6 months Post op Range of movements

Outcome Measures
Radiological union
Lysholm knee score
IKDC grading
Range of motion
Post-operative complications.

RESULTS

A total of 20 patients were included in the study with a higher proportion of males, with road traffic accidents being the most common mechanism of injury. Radiological union was achieved in all patients within an average period of 10-12 weeks. The mean Lysholm scores at final follow up indicated good to excellent functional outcomes.
According to IKDC grading;

- Majority of patients 60% were Grade A (Normal)
- Rest 40% were Grade B (Near normal)

Most patients achieved knee flexion greater than 120 degree, with minimal extension lag with no significant residual instability
Complications were minimal:

- Occasional mild anterior knee pain in a few patients
- No cases of infection implant failure, or residual instability.

Statistical Summary
Preoperative Lysholm score: Mean = 48.95 +/- 2.11, SD= 2.07
Final follow up Lysholm score: Mean = 90.85 +/- 1.97, SD= 1.84
This improvement was statistically highly significant ($p < 0.001$) using paired t-test.

Mode of Injury

Injury	Count
RTA	14
Sports	4
Self-fall	2

Age Distribution

Age Group	Count
18-25	6
26-35	8
36-45	4
46-55	2

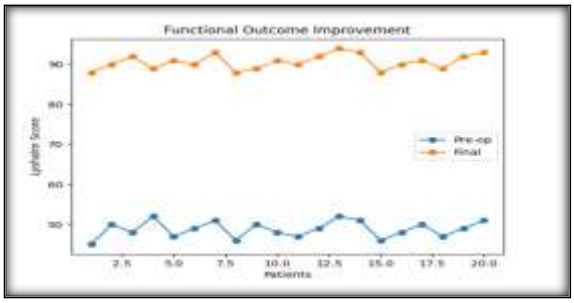

Figure 4: Comparison of preoperative and postoperative Lysholm scores

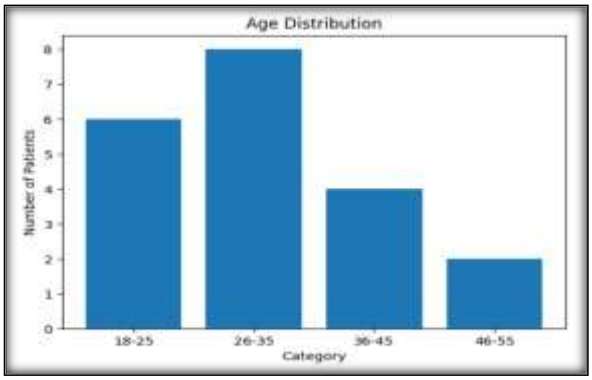

Figure 5: Age distribution of patients

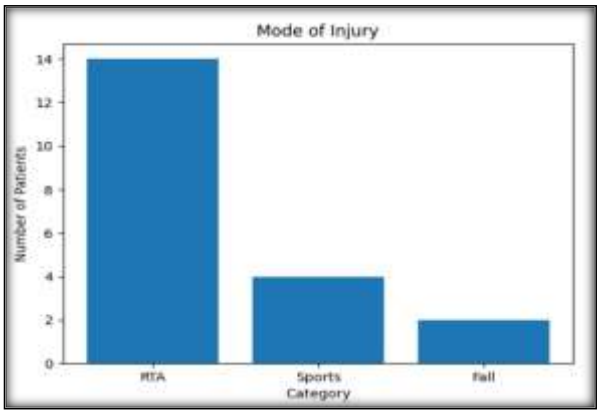

Figure 6: Mode of injury distribution

IKDC Grading

Grade	Count
Grade A	12
Grade B	8
Grade C	0
Grade D	0

DISCUSSION

Posterior cruciate ligament (PCL) tibial avulsion fractures are relatively uncommon injuries, often resulting from high-energy trauma such as road traffic accidents. In the present study, the majority of patients were young adults, with road traffic accidents being the predominant mechanism of injury, which is consistent with previously reported patterns of injury.[10-13]
Accurate diagnosis of these injuries is essential, as missed or inadequately treated cases may lead to chronic posterior instability and early degenerative

changes. Advanced imaging modalities such as CT and MRI play an important role in identifying fracture morphology and associated soft tissue injuries. Griffith JF et al. highlighted the importance of cross-sectional imaging in evaluating cruciate ligament avulsion injuries.[2]

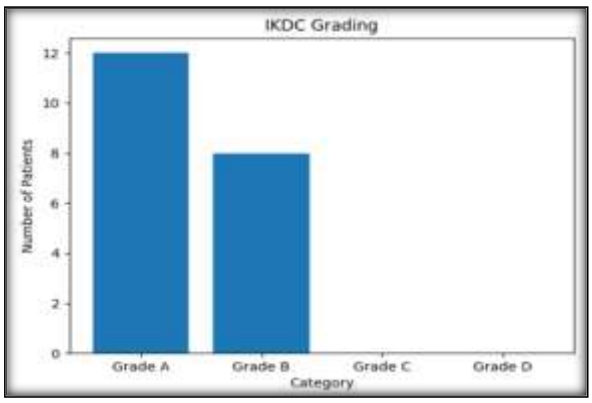

Figure 7: IKDC grading at final follow up.

Management of PCL tibial avulsion fractures depends largely on the degree of displacement. While non-operative treatment has been described for minimally displaced fractures, several authors have reported suboptimal outcomes with conservative management due to persistent laxity. Shelbourne KD et al. demonstrated that untreated PCL injuries may result in long-term functional impairment.[8]

Surgical fixation is therefore recommended for displaced fractures to restore anatomical alignment and ligament tension. Various fixation techniques have been described, including screw fixation, suture fixation, and arthroscopic methods. Among these, cannulated cancellous screw fixation provides rigid stabilization and allows early mobilization. Choi NH et al. reported favorable outcomes following arthroscopic fixation of PCL avulsion fractures.[5]

In the present study, all patients achieved radiological union within 10–12 weeks, which is comparable to findings reported in earlier studies. Functional outcomes were assessed using Lysholm and IKDC scoring systems, both of which demonstrated significant improvement postoperatively. The mean Lysholm score improved from 48.95 ± 2.11 preoperatively to 90.85 ± 1.97 at final follow-up, which was statistically highly significant ($p < 0.001$).

These results are in agreement with studies by Seon JK et al., who reported excellent functional recovery following surgical fixation of PCL avulsion fractures.[12] Similarly, Zhao J et al. demonstrated that stable fixation leads to early rehabilitation and improved clinical outcomes.[13]

The majority of patients in our study were classified as IKDC Grade A or B, indicating good to excellent knee function. No major complications such as infection, implant failure, or persistent instability were observed, suggesting that cannulated screw fixation is a safe and reliable method. Despite these encouraging results, certain limitations must be acknowledged. The sample size was relatively small, and the duration of follow-up was limited. Additionally, the absence of a comparative group restricts the ability to evaluate superiority over other fixation methods. Larger randomized studies with longer follow-up are required to validate these findings.[14,15]

Overall, the results of this study reinforce the current evidence that surgical fixation of displaced PCL tibial avulsion fractures leads to satisfactory functional and radiological outcomes.

CONCLUSION

Cannulated Cancellous screw fixation is a safe and effective method for managing displaced PCL tibial avulsion fractures. It provides stable fixation, promotes early mobilization, and results in good functional outcomes with minimal complications.

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